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=> d his

     (FILE 'HOME' ENTERED AT 11:11:31 ON 29 JUN 2004)
     FILE 'CA' ENTERED AT 11:11:42 ON 29 JUN 2004
L1 10813 S 'SAM' OR SELF ASSEMBL? MONOLAYER
L2   400 S L1 AND BLOCK?
L3  1672 S L1 AND (ELECTRODE OR MICROELECTRODE)
L4   116 S L2 AND L3
L5    32 S L4 NOT PY>1997
L6     1 S L4 AND PATENT/DT AND PY<2000
     FILE 'REGISTRY' ENTERED AT 11:14:52 ON 29 JUN 2004
        E THIOCTIC ACID/CN
L7     5 S E1,E3-8
        SEL NAME L7
     FILE 'CA' ENTERED AT 11:17:00 ON 29 JUN 2004
L8  5356 S L7 OR E1-85
L9    80 S L1 AND L8
L10   11 S (L9 NOT PY>1997)OR(L9 AND PATENT/DT AND PY<2000)
L11 1385 S L1 AND(ANTIBODY OR ANTIGEN OR ENZYM? OR HAPTEN OR PEPTIDE OR
        PROTIEN OR BINDING PARTNER)
L12  225 S L11 AND (ELECTRODE OR MICROELECTRODE)
L13   48 S (L12 NOT PY>1997)OR(L12 AND PATENT/DT AND PY<2000)
L14   85 S L5-6,L10,L13

=> d bib,ab l14 1-85

L14  ANSWER 1 OF 85  CA  COPYRIGHT 2004 ACS on STN
AN   136:366084  CA
TI   Monolayer and electrode for detecting a label-bearing target and method
     of use thereof
IN   Eckhardt, Allen E.; Mikulecky, Jill C.; Napier, Mary E.; Thomas, Robert
     S.; Thorp, H. Holden
PA   The University of North Carolina at Chapel Hill, USA; Xanthon, Inc.
SO   U.S., 19 pp., Cont.-in-part of U.S. Ser. No. 179,665.
PI   US 6387625        B1   20020514       US 2000-596607   20000619
     US 5871918        A    19990216       US 1996-667338   19960620 <--
PRAI US 1995-495817    B2   19950627
AB   An electrode for detecting interactions between members of a binding
     pair, which electrode has been modified by formation of a non-
     conductive self-assembled monolayer, and a method of detecting
     biomols., such as nucleic acids or other targets, including receptors,
     ligands, antigens or antibodies, utilizing such an electrode.  When
     contacted with a target nucleic acid, an oligonucleotide probe coupled
     to the self-assembled monolayer reacts with the target nucleic acid
     form a hybridized nucleic acid on the modified electrode surface.  The
     hybridized nucleic acid is reacted with a transition metal complex
     capable of oxidizing a preselected base in the hybridized nucleic acid
     in an oxidn.-redn. reaction, the oxidn.-redn. reaction is detected, and
     the presence or absence of the nucleic acid is detd. from the detected
     oxidn.-redn. reaction.
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L14 ANSWER 2 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 135:328905 CA
TI Electronic-property probing of biological molecules at surfaces
IN Bamdad, Cynthia C.
PA President and Fellows of Harvard College, USA
SO U.S., 41 pp., Cont.-in-part of U.S. Ser. No. 804,883, abandoned.
PI US 6306584 B1 20011023 US 1997-843623 19970410
PRAI US 1997-786153 B2 19970121
AB A technique for immobilizing biol. mols., in particular nucleic acid strands, is described. Biol. mols. immobilized at surfaces can be used in electron-transfer detection techniques in which a **binding partner** of a biol. mol. is brought into proximity of the surface-immobilized biol. mol., an elec. potential created between the two biol.-binding species, and electron transfer through the species detd. Another technique involves immobilizing a biol. mol. such as a protein, DNA, etc. at a surface via a **self-assembled monolayer**, affecting the biol. mol. via, for example, biol. binding, inducing a change in conformation via a prion, etc., and detecting an electronic property change in the mol. via a change in impedance assocd. with an electronic circuit addressed by the biol. mol. These techniques facilitate combinatorial array detection articles. Compd. [S(CH2)11(OCH2CH2)3N(H)C(O)O-DNA]2, in which the DNA was GTAAG, was prepd. and mixed with 11-mercaptoundecyl oligo(ethylene glycol) to form a self-assembled mixed monolayer on a gold-coated glass slide. Double-stranded DNA having a tail complementary to the immobilized strand was hybridized and ligated to make a DNA-presenting **SAM**. When DNA contg. Gal4 recognition sites was hybridized to the DNA-**SAM**, it selectively bound Gal4 protein but not another DNA-binding protein.

L14 ANSWER 4 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 132:345119 CA
TI Multi-array, multi-specific electrochemiluminescence testing
IN Wohlstadter, Jacob N.; Wilbur, James; Sigal, George; Martin, Mark; Guo, Liang-hong; Fischer, Alan; Leland, Jon
PA Meso Scale Technologies, LLC, USA
SO U.S., 68 pp., Cont.-in-part of U.S. Ser. No. 402,076.
PI US 6066448 A 20000523 US 1996-611804 19960306
PRAI US 1995-402076 A2 19950310
AB Materials and methods are provided for producing patterned multi-array, multi-sp. surfaces which are electronically excited for use in electrochemiluminescence based tests. Materials and methods are provided for the chem. and/or phys. control of conducting domains and reagent deposition for use in flat panel displays and multiply specific testing procedures. Anti-prostate specific **antigen** (PSA) **antibody** immobilized on a patterned gold **electrode** (prepn. given) was used as an electrochemiluminescent sensor for immunoassay of PSA in serum samples.

L14 ANSWER 10 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 128:197112 CA
TI Preparation of **self-assembled monolayer** from micellar solutions
AU Liu, Jian; Kaifer, Angel E.

CS Chem. Dep., Univ. Miami, Coral Gables, FL, 33124, USA
SO Israel Journal of Chemistry (1997), 37(2-3), 235-239
AB The self-assembly of alkanethiols on gold surfaces from micellar aq. solns. was investigated using Triton X-100, sodium dodecylsulfate, and cetyltrimethylammonium bromide as representative nonionic, anionic, and cationic surfactants, resp. The surfactant solns. solubilized the otherwise water-insol. alkanethiols, which self-assembled on gold form organized assemblies very similar to those prepd. using the conventional procedures, i.e., exposure of the gold surface to a nonaq. soln. of the alkanethiol. The resulting derivatized gold **electrodes** exhibited typical electrochem. properties, such as low capacitance values and substantial **blocking** of the voltammetric redn. of Ru(NH3)63+. The concn. of surfactant was found to have profound effect on the rate of alkanethiol chemisorption.

L14 ANSWER 11 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 128:190094 CA
TI Capacitive monitoring of protein immobilization and **antigen-antibody** reactions on monomolecular alkylthiol films on gold **electrodes**
AU Mirsky, Vladimir M.; Riepl, Michael; Wolfbeis, Otto S.
CS Institute of Analytical Chemistry, Chemo- and Biosensors, University of Regensburg, Regensburg, 93040, Germany
SO Biosensors & Bioelectronics (1997), 12(9-10), 977-989
AB **Self-assembled monolayers** of ω-mercaptohexadecanoic acid and ω-mercaptohexadecylamine on gold **electrodes** are stable at neutral pH and display pure capacitive behavior at frequencies around 20 Hz. Different methods of covalent immobilization of proteins on these monolayers are compared. Various reagents including succinimides, thionylchloride, p-nitrophenol and carbodiimides were used to activate the carboxy groups of the adsorbed monolayer of ω-mercaptohexadecanoic acid. Glutaraldehyde, cyanuric chloride and phenylene diisocyanate were used to activate the amino groups of the monolayer of ω-mercaptohexadecylamine. The immobilization of albumin on the activated surface was studied by capacitive measurements. The N-hydroxysuccinimide and carbodiimide methods were identified as most suitable for protein immobilization in that they did not compromise the insulating properties of the alkylthiol layer and led to maximal increase of its dielec. thickness. These approaches were used for a layer-by-layer prepn. of a capacitive immunosensor. Specifically, **antibodies** to human serum albumin were immobilized on the alkylthiol monolayer. Binding of the **antigen** led to a decrease of the **electrode** capacitance. The detection limit of the immunosensor is as low as 15 nM (1 mg/l).

L14 ANSWER 14 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 128:120915 CA
TI **Blocking** behavior of **self-assembled monolayers** on gold **electrodes**
AU Shen, Hong; Mark, James E.; Seliskar, Carl J.; Maryk, Harry B., Jr.; Heineman, William R.
CS Department of Chemistry, University of Cincinnati, Cincinnati, OH,

45221-0172, USA
SO Journal of Solid State Electrochemistry (1997), 1(2), 148-154
AB **Self-assembled monolayers** (**SAMs**) with metal **electrodes**, esp. thiols on Au, are the subject of this investigation because of the unique properties of **SAM**-modified surfaces. Normal alkanethiols are used to modify the surface of a conventional Au **electrode** to **block** certain ions, such as Pb(II) and Cu(II), from the surface of the **electrode**. Normal alkanethiols are also used to study the **SAM**-Au interfacial adsorption-desorption behavior of the **self-assembled monolayer**. The effects of varying chain length of **SAMs**, varying concn. of the alkanethiol solns., immersion time of the pure Au **electrode** in the **SAM** soln., and the stability of a **SAM**-modified Au **electrode** in fresh CHCl3 were investigated by using the oxidn.-redn. peaks of Au. Conditions that optimize the surface coverage and the uniformity of the **SAMs** were detd. Normal alkanethiols are good insulators on the **electrode** surface.

L14 ANSWER 16 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 128:81249 CA
TI Characteristics of redox systems on **self-assembled monolayer**-covered **electrodes**
AU Berchmans, Sheela; Yegnaraman, V.; Rao, G. Prabhakara
CS Central Electrochemical Research Institute, Karaikudi, 630 006, India
SO Proceedings - Indian Academy of Sciences, Chemical Sciences (1997), 109(4), 277-287
AB Electrochem. studies on Au **electrodes** covered with **self-assembled monolayers** (**SAM**) of aminoethane thiol (AET), mercaptobenzothiazole (MBT) and octadecyl mercaptan (ODM) were carried out using cyclic voltammetry. A study of the influence of these monolayers on the double layer capacitance of the interfaces involving the Au/**SAM electrodes** and of the electron transfer kinetics of chosen redox reaction probes, viz., Fe(CN)64-/3-, Fe2+/3+, hydroquinone/quinone(H2Q/Q) and Cu underpotential deposition, offers a wealth of information that can throw light on the role of **SAMs** in allowing/moderating/**blocking** the electron transfer at such interfaces. These details are presented and discussed.

L14 ANSWER 20 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 127:356526 CA
TI **Self-assembled monolayers** with biospecific affinity for lactate dehydrogenase for the electroenzymic oxidation of lactate
AU Schlereth, Daniela D.; Kooyman, Rob P. H.
CS Lehrstuhl fuer Allgemeine Chemie und Biochemie, Technische Universitaet Muenchen, Voettingerstrasse 40, Freising, 85354, Germany
SO Journal of Electroanalytical Chemistry (1997), 431(2), 285-295
AB Surface modified gold **electrodes** with high biospecific affinity for NAD(H)-dependent lactate dehydrogenase have been prepd. by covalent attachment of several triazine dyes to stepwise functionalized mixed alkanethiol **self-assembled monolayers**. The biospecific affinity of such ligand-anchored monolayers to bind submonolayer amts. of **enzyme** was demonstrated from the course of the protein adsorption events

monitored by surface plasmon resonance. Electroenzymic activity measurements of lactate dehydrogenase modified surfaces for the reaction of lactate oxidn., carried out 'ex situ' at different stages of protein layer growth, allowed the optimization of the preparative procedure to yield reproducible **enzymic electrodes** with a low amt. of unspecifically bound protein. A short adsorption time, as well as a high concn. of **enzyme** in the soln. used for protein layer growth, led to lactate dehydrogenase-modified gold **electrode** surfaces with a high electroenzymic activity arising mainly from biospecifically bound species. The lowest amt. of unspecifically adsorbed protein was found for ligand-anchored monolayers prepd. from mixed alkanethiol underlayers with an excess of pos. charged groups. The lack of electroenzymic activity shown by lactate dehydrogenase modified **electrodes** in the absence of sol. coenzyme (NAD+) indicates that none of the investigated ligand-anchored monolayers could provide an efficient electronic pathway from the metal to the active site of the **enzyme**. Therefore, the monolayers acted just as an anchoring system for lactate dehydrogenase.

L14 ANSWER 23 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 127:269369 CA
TI Molecular-level functionalization of **electrode** surfaces. An overview
AU Yegnaraman, V.
CS Electrodics and Electrocatalysis Division, Central Electrochemical Research Institute, Karaikudi, 630 006, India
SO Proceedings - Indian Academy of Sciences, Chemical Sciences (1996), 108(6), 593-604
AB A review with many refs. Electrochem. reactions occur at **electrode**/electrolyte interfaces. Hence, manipulation and design of electrochem. interfaces accompanied by surface modifications have assumed vital importance. Mol. level modification, either at the monolayer or multilayer level of **electrode** surfaces and leading to functionalization of **electrodes**, is being actively pursued by researchers. Modification based on the **self-assembled monolayer** approach has enabled **electrodes** to acquire mol. recognition and mol. electronic characteristics. Functionalization of **electrode** surfaces using polymeric materials and **enzymes** has facilitated **electrodes** in exhibiting properties like catalysis, mol. recognition, electrochromism and birefringence. The results of such mol. level functionalization studies of **electrode** surfaces carried out recently in the authors' labs. are presented in this overview. Besides, some representative results reported from elsewhere are also included.

L14 ANSWER 28 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 127:132482 CA
TI Electrochemical and surface plasmon resonance characterization of the step-by-step self-assembly of a biomimetic structure onto an **electrode** surface
AU Pierrat, Olivier; Lechat, Nathalie; Bourdillon, Christian; Laval, Jean-Marc
CS Laboratoire de Technologie Enzymatique UPRESA 6022, Universite de

Technologie de Compiegne, Compiegne, 60205, Fr.
SO Langmuir (1997), 13(15), 4112-4118
AB A plane gold-supported bilayer was prepd. on an **electrode** by fusion of phospholipid (dimyristoylphosphatidylcholine (DMPC)) vesicles onto an alkanethiol (octadecylmercaptan (OM)) **self-assembled monolayer** (**SAM**). Escherichia coli pyruvate oxidase (Pox), a peripheral membrane **enzyme**, was incorporated into the supported bilayer. This supramol. assembly was characterized by contact angle goniometry, electrochem. **blocking** studies, double-layer capacitance, and BIAlite (surface plasmon resonance) measurements. Electrochem. of ferrocenemethanol at the gold surface was **blocked** by the well-ordered alkane chains of the OM monolayer. In order to prevent this **blocking** effect, dibenzyl disulfide (DBDS) was used to produce defect sites in the OM monolayer and to allow the reversibility of ferrocene electrochem. BIAlite measurements showed that fusion of DMPC on the OM + DBDS monolayer was not significantly different from the fusion of DMPC on the OM monolayer. Pox incorporation into the OM + DBDS/DMPC gold-supported bilayer was detected by BIAlite measurements. The activity of incorporated Pox was detected by the electrocatalytic current produced when substrate and the electron acceptor, ferricinium methanol, were present in soln.

L14 ANSWER 30 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 127:106129 CA
TI **Self-assembled monolayers** of thiols on gold **electrodes** for bioelectrochemistry and biosensors
AU Dong, Shaojun; Li, Jinghong
CS Laboratory of Electroanalytical Chemistry, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, Changchun, Peop. Rep. China
SO Bioelectrochemistry and Bioenergetics (1997), 42(1), 7-13
AB Monolayers of biol. compds. including redox proteins and **enzymes**, and phospholipids have been immobilized on a gold **electrode** surface through self-assembling. These proteins and **enzymes**, such as cytochrome c, cytochrome c oxidase and horseradish peroxidase (HRP), immobilized covalently to the **self-assembled monolayers** (**SAMs**) of 3-mercaptopropionic acid on a gold **electrode**, communicate directly electrons with the **electrode** surface without mediators and keep their physiol. activities. The electron transfer of HRP with the gold **electrode** can also be mediated by the alkanethiol **SAMs** with electroactive group viologens on the gold **electrode** surface. All these direct electrochemistries of proteins and **enzymes** might offer an opportunity to build a third generation of biosensors without mediators for analytes, such as H2O2, glucose and cholesterol. Monensin and valinomycin have been incorporated into the bilayers on the gold **electrode** consisting of the **SAMs** of alkanethiol and a lipid monolayer, which have high selectivity for monovalent ions, and the resulting Na+ or K+ sensor has a wide linear range and high stability. These self-assembly systems provide a good mimetic model for studying the physiol. function of a membrane and its assocd. **enzyme**.

L14 ANSWER 31 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 127:92241 CA
TI Minizymes. A new strategy for the development of reagentless amperometric biosensors based on direct electron-transfer processes
AU Loetzbeyer, Thomas; Schuhmann, Wolfgang; Schmidt, Hanns-Ludwig
CS Lehrstuhl fuer Allgemeine Chemie und Biochemie, Technische Universitaet Muenchen, Voettingerstr. 40, D-85350, Freising-Weihenstephan, Germany
SO Bioelectrochemistry and Bioenergetics (1997), 42(1), 1-6
AB Direct electron transfer between an immobilized biol. compd. and an **electrode** is one of the most interesting transduction processes for the development of fast responding amperometric biosensors. Different biocatalysts like horseradish peroxidase, cytochrome c, myoglobin, microperoxidase MP-11 and hemin, all catalyzing the redn. of H2O2, have been investigated on their ability for direct electron-transfer reactions when covalently tethered to **self-assembled monolayers** (**SAMs**) on gold. As direct electron-transfer processes are predominantly limited by the distance between the active site of the biocompound and the **electrode** surface, the highest electrocatalytic efficiency with the monolayer-immobilized biocatalysts was obsd. for the smallest peroxidase-active compds. (e.g., microperoxidase MP-11, hemin). Although these compds. show a significant lower catalytic activity for the redn. of H2O2 in homogeneous soln., the catalytic activity of horseradish peroxidase is by a factor of 3300 higher as compared with that of hemin. Hemin exhibits a more than tenfold higher electrocatalytic activity when immobilized at a monolayer. This tremendous difference between the catalytic activity in homogeneous soln. and the electrocatalytic activity of the monolayer-immobilized biocatalyst could be attributed to a higher surface concn. for the smaller compds., the improved access for the substrate to their active sites and, most significantly, the increased electron-transfer rate due to the decrease of the distance between redox site of the biocatalyst and **electrode** surface. Hence, for the development of **enzyme electrodes** based on direct electron-transfer processes between monolayer-immobilized biocatalysts and the **electrode** the size of the biocatalyst itself should be decreased. Such catalytically-active compds. with decreased protein shell have been called minimized **enzymes** or minizymes.

L14 ANSWER 32 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 127:92171 CA
TI Characteristics of the glucose oxidase at different surfaces
AU Dong, Xian-Dui; Lu, Juntao; Cha, Chuansin
CS Department of Chemistry, Wuhan University, Wuhan, Peop. Rep. China
SO Bioelectrochemistry and Bioenergetics (1997), 42(1), 63-69
AB By adsorption or chem. bonding, glucose oxidase (GOD) mols. are immobilized to different surfaces, including bare Pt and Au, alkanethiols **self-assembled monolayers**, and ω-carboxylic acid thiols **self-assembled monolayers** (**SAM**). Except Au and reduced Pt surfaces, GOD can be immobilized on all the surfaces tested. The most durable immobilization is achieved by covalent bonding GOD to carboxylic terminated **SAM**. In most cases the immobilized GOD retains its native

enzymic activity. A chain length dependence of the apparent Michaelis const. is found for the GOD adsorbed at carboxylic group terminated **SAM** and the possible reasons are discussed.

L14 ANSWER 38 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 127:2652 CA
TI 3D organized **self-assembled monolayer electrodes**. A novel biosensor configuration
AU Sampath, Srinivasan; Lev, Ovadia
CS Fredy and Nadine Herrmann School Applied Science, Hebrew University, Jerusalem, 91904, Israel
SO Advanced Materials (Weinheim, Germany) (1997), 9(5), 410-413
AB A bulk modified **electrode** with 3-dimensional **self-assembled monolayers** (**SAMs**) is introduced and a leak-free, reagentless biosensor for glucose is demonstrated as an application. The prepn. of the **electrode** and the electrochem. investigations of its behavior are described. Model **enzymes** can be incorporated into these matrixes so that the biomols. retain their activity and the **SAMs** their dense structure and charge-mediation properties.

L14 ANSWER 44 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 126:154750 CA
TI Functionalization of Gold Surfaces for Specific and Reversible Attachment of a Fused β-Galactosidase and Choline-Receptor Protein
AU Madoz, Juan; Kuznetzov, Boris A.; Medrano, Francisco J.; Garcia, Jose L.; Fernandez, Victor M.
CS Instituto de Catalisis, CSIC, Madrid, 28049, Spain
SO Journal of the American Chemical Society (1997), 119(5), 1043-1051
AB A method that allows the specific immobilization of proteins onto a gold **electrode** was developed. Mixed **self-assembled monolayers** of thiol chains functionalized with choline and hydroxyl groups were synthesized step-by-step over a template of thiocarboxylic acid adsorbed onto gold. Choline-functionalized monolayers displayed affinity for a chimera protein made by the fusion of the β-galactosidase (β-Gal) from Escherichia coli and the choline-binding domain of the (acetylmuramoyl)-L-alanine amidase (C-LYTA) from Streptococcus pneumoniae. This chimera maintains both the hydrolase activity and the affinity for choline, resp., of its parent proteins. The binding of the protein to the tailored interface was specific and could be inhibited either by sol. choline or by satg. the monolayer choline groups with the C-LYTA fragment. By using a 35S-labeled chimera, satn. coverage was found under optimized binding conditions. The activity of the immobilized chimera was detd. with (p-aminophenyl)-β-D-galactopyranoside, a synthetic substrate of β-galactosidase. The product of the **enzymic** reaction, p-aminophenol, was detected electrochem. by using the functionalized gold surface with bound chimera protein as a working **electrode** in a conventional electrochem. cell. Gold **electrodes** covered with chimera protein were very stable and gave fast and reproducible electrochem. response to the addn. of β-Gal substrate in a conventional flow-injection anal. system.

L14 ANSWER 52 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 125:31602 CA
TI A 'mixed' **self-assembled monolayer** for an impedimetric immunosensor
AU Rickert, Jan; Goepel, Wolfgang; Beck, Werner; Jung, Guenther; Heiduschka, Peter
CS Institute of Physical and Theoretical Chemistry, University of Tuebingen, Tuebingen, D-72076, Germany
SO Biosensors & Bioelectronics (1996), 11(8), 757-768
AB A synthetic **peptide** with the amino acid sequence 135-154 of the capsid protein VP1 of the foot-and-mouth-disease virus was modified with ω-hydroxyundecanethiol and applied together with non-derivatized ω-hydroxyundecanethiol for consecutive adsorption onto gold **electrodes** according to self-assembling procedures. The binding of a specific **antibody** to prepd. recognition layers could be monitored by measurement of impedance or capacitance. In order to avoid non-specific effects, all measurements were performed in the presence of BSA. The complex between the antigenic **peptide** and the **antibody** was split by applying 6 M urea soln. The gold **electrodes** were mounted into an optimized flow-through system in order to perform capacitance-time measurements. The immobilized **peptide** can be recognized

L14 ANSWER 57 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 124:25093 CA
TI Electroenzymic sensing of fructose using fructose dehydrogenase immobilized in a **self-assembled monolayer** on gold
AU Kinnear, K. T.; Monbouquette, H. G.
CS Chem. Eng. Dep., Univ. California, Los Angeles, CA, 90095-1592, USA
SO ACS Symposium Series (1995), 613(Biosensor and Chemical Sensor Technology), 82-6
AB The hydrophobic **enzyme**, fructose dehydrogenase (from Gluconobacter sp., EC 1.1.99.11), and coenzyme Q6 have been coimmobilized in a **self-assembled monolayer** (**SAM**) on gold through a detergent dialysis procedure to create a prototype fructose biosensor. The **SAM** consists of a mixt. of octadecyl mercaptan (OM) and two short chain disulfides, which form -S-CH2-CH2-CH2-COO- and -S-CH2-CH2-NH3+ on the surface. The short chain, charged modifiers may provide defects, or pockets, in the OM layer where the **enzyme** may adsorb through electrostatic interactions. At oxidizing potentials, the **electrode** generates a catalytic current at densities up to about 10 μA/cm2 when exposed to fructose soln. The **enzyme electrode** exhibits a response time well under a minute and the calibration curve is linear at fructose concns. up to 0.8 mM. The biosensor prototype exhibits low susceptibility to pos. interference by ascorbic acid indicating that this construct could be useful for fructose anal. of citrus fruit juice.

L14 ANSWER 58 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 123:352967 CA
TI Ion-selective monolayer membranes based on self-assembling tetradentate ligand monolayers on gold **electrodes**: nature of the ionic selectivity

AU Steinberg, Suzi; Tor, Yitzhak; Shanzer, Abraham; Rubinstein, Israel
CS Department of Materials & Interfaces, Weizmann Institute of Science, Rehovot, 76100, Israel
SO Thin Films (San Diego, CA, United States) (1995), 20, 183-205
AB The authors showed that monolayer membranes comprising the ligand TBEA (2,2'-thiobisethyl acetoacetate) and an inert **blocking** component (OM (n-octadecyl mercaptan), OTS (n-octadecyl trichlorosilane), or a combination thereof) on Au **electrodes** provide a unique example of organized monomol. systems designed to perform a specific function, i.e., recognition and selective electrochem. response for certain ions. The performance of these systems derives from their ability to fulfill 2 functions simultaneously: (1) selectively binding certain ions while (2) denying other ions access to the **electrode**. Thus, highly selective responses for certain divalent ions (e.g., Cu2+ or Pb2+) are obsd. in the presence of large concns. of other ions (e.g., Fe2+ or Fe3+). The mechanism responsible for the ionic selectivity was studied by using 2 complementary types of expts.: ionic competition (i.e., the response to a certain ion in the presence of another ion in soln.) and electrochem. behavior at intentionally induced monolayer pinholes. The pronounced ionic competition obsd. with TBEA-based monolayers on the one hand, and the lack of any competition at monolayer pinholes on the other hand, provide strong support for a selectivity mechanism based on the binding of selected ions to TBEA mols. in the monolayer. The use of a polymerizable **blocking** component (OTS) substantially improves the lifetime of the monolayer membranes. Moreover, signs of deterioration of the performance can be easily reversed by applying "monolayer healing" procedures. Such monolayer systems may thus be useful as sensing elements for trace amts. of certain ions in the presence of large concns. of nonbinding ions. A major conclusion of the present work concerns the selectivity considerations. As can be expected, the requirements for binding of an ion to TBEA in a monomer membrane are very different from the case of binding in soln. The 2-D arrangement of closely packed TBEA mols. in the monolayer membrane defines the coordination geometry and the cavity dimensions for ionic binding. The latter is an interesting example of a cooperative effect: inadequate matching of the ionic size of a bound ion to the cavity dimensions (either smaller or larger) introduces a local structural disturbance in the monolayer. This disturbance is transferred to neighboring mols. by virtue of the monolayer packing, giving rise to a lower effective binding const. Such considerations, playing a prominent role in the case of TBEA monolayer membranes, must be taken into account in the design of future monolayer systems based on binding, penetration, and specific interactions. Some aspects of TBEA monolayer membrane systems still remain unclear, for example, the observation that Fe(CN)64-ions produce a sizable electrochem. signal at Au/(TBEA + **blocking** component) **electrodes**, which appear completely **blocking** toward nonbinding cations. This emphasizes the fact that penetration mechanisms in **self-assembling monolayers** are still not entirely understood.

L14 ANSWER 60 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 123:107042 CA

TI Bifunctional dialkyl disulfide reagent having terminal succinimidoxy ester group. Fabrication of gold surfaces with bioaffinity ligands for impedimetric biosensors.
AU Nakano, K.; Taira, H.; Maeda, M.; Takagi, M.
CS College General Education, Kyushu University, Ropponmatsu, 810, Japan
SO Transactions of the Materials Research Society of Japan (1994), 15A(Biomaterials, Organic and Intelligent Materials), 635-8
AB A gold **electrode** surface was modified with the **self-assembled monolayer** of bis(10-(N-succinimidoxy) carbonydecyl disulfide) (1). Electrochem. properties of the **electrode** were characterized by cyclic voltammetry and impedance measurements. The former technique showed a surface coverage ratio of 0.34 was attained. By taking advantages of the reaction of the terminal succinimidoxy ester group of 1 and amino groups, the **electrode** was applied to **enzyme** immobilization. A possible application to an electrochem. sensor of the resulting modified **electrode** based on an impedimetric principle was also investigated.

L14 ANSWER 61 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 123:106257 CA
TI Direct electron transfer reactions of glucose oxidase immobilized at a **self-assembled monolayer**
AU Jiang, Li; McNeil, Calum J.; Cooper, Jonathan M.
CS Dep. Electron. Electr. Eng., Univ. Glasgow, G12 8LT, UK
SO Journal of the Chemical Society, Chemical Communications (1995), (12), 1293-5
AB The direct electrochem. of glucose oxidase, immobilized at a **self-assembled monolayer** of 3,3'-dithiobis-sulfocinnimidylpropionate (DTSSP) is reported, and electron transfer kinetics of the biocomposite assembly are discussed.

L14 ANSWER 64 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 122:260497 CA
TI Immobilization of proteins on gold coated porous membranes via an activated **self-assembled monolayer** of **thioctic acid**
AU Duan, Chuanming; Meyerhoff, Mark E.
CS Dep. Chem., Univ. Michigan, Ann Arbor, MI, 48109, USA
SO Mikrochimica Acta (1995), 117(3-4), 195-206
AB A new methodol. for efficient protein (e.g., antibodies, enzymes, etc.) immobilization on microporous nylon membranes for use in a variety of bioanal. systems is introduced. The method utilizes an activated **self-assembled monolayer** (**SAM**) of **thioctic acid** on gold coated forms of the membranes. Via a carbodiimide mediated reaction, the protein is anchored to the gold surface through an amide bond with the terminal carboxyl group of the adsorbed **thioctic acid**. The immobilization efficiency is high for a monoclonal IgG and the surface bound protein appears to be stable enough to resist any displacement by other proteins in a matrix as complex as serum. Immunol. activity of immobilized antibody is retained as demonstrated via use of such membranes in colorimetric ELISA for human chorionic gonadotropin (hCG). The high protein immobilization efficiency, the high tensile strength of microporous nylon membranes, and the excellent electrochem.

characteristics of gold make this approach very attractive for prepg. biomembranes that should be useful in affinity chromatog., electrochem. immunosensing systems, flow-through enzyme reactors, etc.

L14 ANSWER 69 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 120:265159 CA
TI Separation-Free Sandwich **Enzyme** Immunoassays Using Microporous Gold **Electrodes** and **Self-Assembled Monolayer**/Immobilized Capture **Antibodies**
AU Duan, Chuanming; Meyerhoff, Mark E.
CS Department of Chemistry, University of Michigan, Ann Arbor, MI, 48109, USA
SO Analytical Chemistry (1994), 66(9), 1369-77
AB A novel **enzyme** immunoassay for proteins is performed by designing an electrochem. detection system that enables preferential measurement of surface-bound **enzyme**-labeled **antibody** relative to the excess **enzyme**-labeled reagent in the bulk sample soln. In this initial model system, the assay is carried out using gold-coated microporous nylon membranes (pore size 0.2 μm) which are mounted between two chambers of a diffusion cell. The membrane serves as both a solid phase for the sandwich assay and the working **electrode** in the three-**electrode** amperometric detection system. The capture monoclonal **antibody** is immobilized covalently on the gold side of the membrane via a **self-assembled monolayer** of **thioctic acid**. In the sepn.-free sandwich assay, both model analyte protein (human chorionic gonadotropin; hCG) and alk. phosphatase-labeled anti-hCG (ALP-Ab) are incubated simultaneously with the immobilized capture anti-hCG **antibody**. Surface-bound ALP-Ab is spatially resolved from the excess conjugate in the bulk sample soln. by introducing the **enzyme** substrate (4-aminophenyl phosphate) through the back side of the porous membrane. The substrate diffuses rapidly through the porous membrane where it first encounters bound ALP-Ab at the gold surface. The **enzymically** generated product, aminophenol, is detected immediately by oxidn. at the gold **electrode** (at +0.19 V vs Ag/AgCl), and the magnitude of current is directly proportional to the concn. of hCG in the sample. The response time after substrate addn. is <1 min, although max. response toward the analyte protein requires a sample/conjugate preincubation time of 30 min with the porous **electrode**. The assay is demonstrated to function effectively in both buffer and whole human blood with a detection limit of 2.5 units/L hCG (in blood), which is comparable to most of heterogeneous EIAs that require multiple washing steps.

L14 ANSWER 80 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 117:103059 CA
TI Selectivity and sensitivity of self-assembled **thioctic acid** electrodes
AU Cheng, Quan; Brajter-Toth, Anna
CS Dep. Chem., Univ. Florida, Gainesville, FL, 32611-2046, USA
SO Analytical Chemistry (1992), 64(17), 1998-2000
AB **Thioctic acid** was self-assembled on Au electrodes prepd. by vacuum deposition of Au on single crystal silicon. The resulting film was shown to be permeable. The effect of soln. pH on the response of the electrodes was investigated. Selectivity to ionic probes was shown to

depend on the charge d. of the film. Sensitive response indistinguishable from that of the bare electrode could be obsd. for cations and anions.

L14 ANSWER 82 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 116:186841 CA
TI Ion-selective monolayer membranes based upon self-assembling tetradentate ligand monolayers on gold **electrodes**. 3. Application as selective ion sensors
AU Steinberg, Suzi; Rubinstein, Israel
CS Dep. Mater. Interfaces, Weizmann Inst. Sci., Rehovot, 76100, Israel
SO Langmuir (1992), 8(4), 1183-7
AB Gold **electrodes** coated with mixed monolayer membranes comprising 2,2'-thiobis(Et acetatoacetate) (TBEA) and n-octadecyltrichlorosilane (OTS) respond selectively to certain divalent ions (e.g. Cu2+, Pb2+) while completely **blocking** the electrochem. response of other ions (e.g. Fe2+). This unique property is exploited for demonstrating the feasibility of using **self-assembling monolayers** for electroanal. sensing. Hence, a direct voltammetric scheme is described for the detn. of Cu2+ and Pb2+ ions at an Au/(TBEA + OTS) **electrode**, and an indirect scheme is shown for the detn. of Zn2+ ions. In all cases, the presence of a large excess of Fe2+ ions has no effect on the anal. The potential application of such monolayer systems as sensor elements in future mol.-size technol. is emphasized.

L14 ANSWER 83 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 114:177550 CA
TI Ionic recognition and selective response in **self-assembling monolayer** membranes on **electrodes**
IN Sagiv, Jacob; Rubinstein, Israel; Steinberg, Suzi; Shanzer, Abraham; Tor, Yitzhak
PA Yeda Research and Development Co., Ltd., Israel
SO U.S., 8 pp.
PI US 4964972 A 19901023 US 1989-330508 19890330 <--
PRAI US 1989-330508 19890330
AB Org. monolayer films are applied to an elec. conductive substrate, resulting in an **electrode** which can be used in electrochem. processes. This film serves as an ultrathin membrane and allows certain selected species to approach the substrate and be detected. The film comprises active species which are selective towards specific species contained in mixt. with others and a **blocking** surface sealing component. It is also possible to use one compd. serving both purposes. The components of the film are attached to the substrate by a variety of means: adsorption, chemisorption, or electrochem. deposition.

L14 ANSWER 84 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 109:2722 CA
TI Ionic recognition and selective response in **self-assembling monolayer** membranes on **electrodes**
AU Rubinstein, Israel; Steinberg, Suzi; Tor, Yitzhak; Shanzer, Abraham; Sagiv, Jacob

CS Dep. Mater. Res., Weizmann Inst. Sci., Rehovot, 76100, Israel
SO Nature (London, United Kingdom) (1988), 332(6163), 426-9
AB The 1st example of an **electrode** coated with a stable, ion-selective artificial membrane having the thickness of just 1 mol., which successfully mimics basic structural and functional principles of the natural bilayer membrane is presented. This monolayer membrane, produced by mol. self-assembly on Au can recognize a selected metal ion in the presence of other ions, and thus induces a specific **electrode** response. It consists of synthetic receptor sites, designed to impart the desired selectivity, embedded within an inert monolayer matrix which **blocks** vacant sites on the surface and prevents the passage of undesired species. The supporting Au **electrode** permits electrochem. anal. of the membrane structure and performance. Such monolayer membranes may aid the study of elementary charge transfer processes at liq.-solid interfaces, and contribute to future mol.-based technologies.

L14 ANSWER 85 OF 85 CA COPYRIGHT 2004 ACS on STN
AN 107:244955 CA
TI Organized **self-assembling monolayers** on **electrodes**. 2. Monolayer-based ultramicroelectrodes for the study of very rapid **electrode** kinetics
AU Sabatani, Eyal; Rubinstein, Israel
CS Dep. Mater. Res., Weizmann Inst. Sci., Rehovot, 76100, Israel
SO Journal of Physical Chemistry (1987), 91(27), 6663-9
AB Organized monolayers were constructed on Au **electrodes** by self-assembly of octadecyl derivs. with trichlorosilane or mercaptan head groups. The monolayers, which are highly oriented and densely packed, provide effective **blocking** of electrochem. reactivity at coated **electrodes**. With fractional surface coverages θ close to 1, the remaining exposed **electrode** surface 1 - θ is distributed as an array of extremely small ultramicroelectrodes with an av. diam. of 5-10 nm. Such **electrodes** provide distinct advantages in various types of fundamental electrochem. studies, including background suppression; electron-transfer mediation, and most notably, in the measurement of very large heterogeneous electron-transfer rate consts. k0. Several such cases were shown, including convenient detn. of k0 values as high as 5.0 cm/s. Values of k0 measured in the present work are in good agreement with those calcd. from known self-exchange rate consts. by using the Marcus relationship.

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